

WHAT IS CLAIMED IS:

1. A reinforced amorphous metal object comprising:
an amorphous metal alloy forming a substantially continuous matrix; and
a second ductile metal phase embedded in the matrix and formed in situ in the matrix by crystallization from a molten alloy.
2. A composite amorphous metal object as recited in claim 1 wherein the second phase is in the form of particles precipitated in situ from nucleation sites distributed in a melt comprising the amorphous metal alloy and second phase alloy.
3. A composite amorphous metal object as recited in claim 1 wherein the second phase is formed from a molten alloy having an original composition in the range of from 52 to 68 atomic percent zirconium, 3 to 17 atomic percent titanium, 2.5 to 8.5 atomic percent copper, 2 to 7 atomic percent nickel, 5 to 15 atomic percent beryllium, and 3 to 20 atomic percent niobium.
4. A composite amorphous metal object as recited in claim 1 wherein the second phase is sufficiently spaced apart for inducing a uniform distribution of shear bands throughout a deformed volume of the composite, the shear bands involving at least four volume percent of the composite before failure in strain and traversing both the amorphous metal phase and the second phase.

5. A composite amorphous metal object as recited in claim 1 wherein the second phase comprises particles having a particle size in the range of from 0.1 to 15 micrometers.

6. A composite amorphous metal object as recited in claim 5 wherein the second phase comprises particles having a particle size in the range of from 10 to 15 micrometers.

7. A composite amorphous metal object as recited in claim 1 wherein the second phase comprises particles having a spacing between adjacent particles in the range of from 0.1 to 20 micrometers.

8. A composite amorphous metal object as recited in claim 7 wherein the spacing between adjacent particles in the range of from 1 to 10 micrometers.

9. A composite amorphous metal object as recited in claim 1 wherein the second phase comprises in the range of from 5 to 50 volume percent of the composite.

10. A composite amorphous metal object as recited in claim 1 wherein the second phase comprises in the range of from 15 to 35 volume percent of the composite.

11. A composite amorphous metal object as recited in claim 1 wherein second phase is in the form of dendrites.

12. A composite amorphous metal object as recited in claim 1 wherein the volumetric proportion of the amorphous metal phase is less than 50%.

13. A reinforced amorphous metal object as recited in claim 1 wherein above the elastic limit a stress-strain curve of the composite amorphous metal alloy and ductile metal phase exhibits a slope $d\sigma/d\varepsilon > 0$, wherein σ is stress and ε is strain.